

AMENDMENTS TO THE CLAIMS

1-118. (Cancelled)

119. (Currently Amended) In radiation therapy using a radiation delivery system having a radiation source that directs a radiation beam to a beam isocenter, an apparatus for locating and tracking a treatment target in a patient comprising:

a wireless marker configured to be implanted in the patient at a site relative to the treatment target wherein the marker is energized or excited by an excitation source positioned exterior of the patient;

a plurality of sensors in a fixed and known geometry relative to each other that obtain position information about the location and/or orientation of the marker; and

a computer operatively coupled to the sensor, the computer having a computer operable medium containing instructions that cause the computer to (a) receive the position information data from the sensor 12 or more times per minute, (b) determine an actual location of the treatment target, and (c) compute a displacement between the treatment target and the beam isocenter while the sensor obtains the position information.

120. (Previously Presented) The apparatus of claim 119 wherein the instructions contained by the computer operable medium further cause the computer to compute the displacement between the treatment target and the beam isocenter in three dimensions based on the actual location of the treatment target.

121. (Previously Presented) The apparatus of claim 119 wherein the instructions contained by the computer operable medium further cause the computer to:
compute the displacement between the treatment target and the beam isocenter
in three dimensions based on the actual location of the treatment target;
and
provide the computed displacement between the treatment target and the beam isocenter to at least one of (a) an operator, (b) a control system and (c) a radiation delivery device at least every five seconds while irradiating the patient.

122. (Previously Presented) The apparatus of claim 119 wherein the instructions contained by the computer operable medium further cause the computer to compute the displacement between the treatment target and the beam isocenter in three dimensions based on the actual location of the treatment target so that the patient can be moved according to the computed displacement while the sensor obtains the position information.

123. (Previously Presented) The apparatus of claim 119 wherein the instructions contained by the computer operable medium further cause the computer to:
compute the displacement between the treatment target and the beam isocenter
in three dimensions based on the actual location of the treatment target;
and
provide the computed displacement between the treatment target and the beam isocenter to at least one of (a) an operator, (b) a control system and (c) a radiation delivery device at least every five seconds so that the patient can be moved while the sensor obtains the position information to maintain the treatment target in an acceptable range from the beam isocenter.

124. (Currently Amended) In radiation therapy using a radiation delivery system having a radiation source that directs a radiation beam to a beam isocenter, an apparatus for locating and tracking a treatment target in a patient comprising:

a wireless marker configured to be implanted in the patient at a site relative to the treatment target wherein the marker is energized by an external excitation source;

a plurality of sensors in a fixed and known geometry relative to each other that obtain position information about the location and/or orientation of the marker; and

a computer operatively coupled to the sensor, the computer having a computer operable medium containing instructions that cause the computer to perform the method of (a) directing the radiation beam to the beam isocenter for irradiating the patient, (b) sensing the wireless marker to obtain position information related to a location of the wireless marker, and (c) determining an actual location of the treatment target at least twelve times per minute based on the position information of the wireless marker and providing feedback of the actual location of the treatment target in a manner that tracks the motion of the treatment target while sensing the marker.

125. (Currently Amended) In radiation therapy using a radiation delivery system having a radiation source that directs a radiation beam to a beam isocenter, an apparatus for locating and tracking a treatment target in a patient comprising:

a wireless marker configured to be implanted in the patient at a site relative to the treatment target wherein the marker is not physically connected with an outside energy source;

a plurality of sensors in a fixed and known geometry relative to each other that obtain position information about the location and/or orientation of the marker; and

a computer operatively coupled to the sensor, the computer having a computer operable medium containing instructions that cause the computer to perform the method of (a) irradiating at least a portion of the patient with the radiation beam, (b) sensing a characteristic of the marker using the sensor while irradiating the patient, (c) determining an actual position of the treatment target based on the sensed characteristic of the marker, and (d) providing feedback information correlating the actual position of the treatment target with the beam isocenter generally while the patient is proximate to the sensor.

126. (Currently Amended) In radiation therapy using a radiation delivery system having a radiation source that directs a radiation beam to a beam isocenter, an apparatus for locating and tracking a treatment target in a patient comprising:

a wireless marker configured to be implanted in the patient at a site relative to the treatment target wherein the marker is energized or excited by an excitation source positioned exterior of the patient;

a plurality of sensors in a fixed and known geometry relative to each other that obtain position information about the location and/or orientation of the marker; and

a computer operatively coupled to the sensor, the computer having a computer operable medium containing instructions that cause the computer to perform a method while the patient is on a patient support of the radiation delivery system such that the wireless marker can be sensed by the sensor, the method comprising (a) irradiating at least a portion of the patient with the radiation beam, (b) obtaining position information about the position and/or orientation of the wireless marker from the sensor, (c) determining an actual location of the treatment target relative to the beam isocenter based on the position information obtained from the sensor, and (d) computing a relative position between the treatment target and the

beam isocenter based on the actual location of the treatment target at least twelve times per minute while the patient is on the patient support.

127. (Currently Amended) In radiation therapy using a radiation delivery system having a radiation source that directs a radiation beam to a beam isocenter, an apparatus for locating and tracking a treatment target in a patient comprising:

a wireless marker configured to be implanted in the patient at a site relative to the treatment target, wherein the marker generates a response signal in reaction to an excitation energy wherein the marker is not physically connected with an outside energy source;

a plurality of sensors in a fixed and known geometry relative to each other that obtain position information about the location and/or orientation of the marker; and

a computer operatively coupled to the sensor, the computer having a computer operable medium containing instructions that cause the computer to perform the method of (a) directing the radiation beam to the patient, (b) sensing the response signal from the marker to obtain position information related to a location of the marker, and (c) determining an actual location of the treatment target at least twelve times per minute based on the position information of the marker to track the motion of the treatment target while sensing the marker.

128. (Currently Amended) In radiation therapy using a radiation delivery system having a radiation source that directs a radiation beam to a beam isocenter, an apparatus for locating and tracking a portion of a patient comprising:

a wireless marker configured to be implanted in the patient at a site relative to the portion of the patient wherein the marker is energized by an external excitation source;

a plurality of sensors in a fixed and known geometry relative to each other that obtain position information about the location and/or orientation of the marker; and

a computer operatively coupled to the sensor, the computer having a computer operable medium containing instructions that cause the computer to perform the method of (a) sensing a characteristic of the marker to obtain position information related to the location of the marker, and (b) determining an actual location of the portion of the patient based on the position information and providing feedback of the actual location of the portion of the patient while sensing the marker.

129. (Currently Amended) In radiation therapy using a radiation delivery system having a radiation source that directs a radiation beam to a beam isocenter, an apparatus for tracking a patient comprising:

a wireless marker configured to be implanted in the patient wherein an excitation source is configured to remain outside the patient;

a plurality of sensors in a fixed and known geometry relative to each other that obtain position information about the location and/or orientation of the marker; and

a computer operatively coupled to the sensor, the computer having a computer operable medium containing instructions that cause the computer to perform the method of (a) sensing a characteristic of the marker to obtain position information related to the location of the marker, and (b) determining an actual location of the marker based on the position information and providing feedback of the actual location of the marker while the patient is proximate to the sensor that obtains the position information of the target.

130. (Currently Amended) In radiation therapy using a radiation delivery system having a radiation source that directs a radiation beam to a beam isocenter, an apparatus for tracking a patient comprising:

a wireless marker configured to be implanted in the patient wherein the marker is energized by an external energy source;

a plurality of sensors in a fixed and known geometry relative to each other that obtain position information about the location and/or orientation of the marker; and

a computer operatively coupled to the sensor, the computer having a computer operable medium containing instructions that cause the computer to perform the method of (a) sensing a characteristic of the marker to obtain position information related to the location of the marker, and (b) determining an actual location of the marker based on the position information and providing feedback of the actual location of the marker in a manner that tracks motion of the marker while sensing the marker.